

Attorney's Docket No. 1030662-000113

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	)	
Yoji ITO	)	Group Art Unit: 1772
Application No.: 10/508,864	)	Examiner: Sow Fun HON
Filed: September 24, 2004	)	Confirmation No.: 6693
For: OPTICAL COMPENSATORY	)	
SHEET COMPRISING POLYMER	)	
FILM	)	

**DECLARATION PURSUANT TO 37 C.F.R. §1.132**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

I, Hiroshi Takeuchi, declare and state the following:

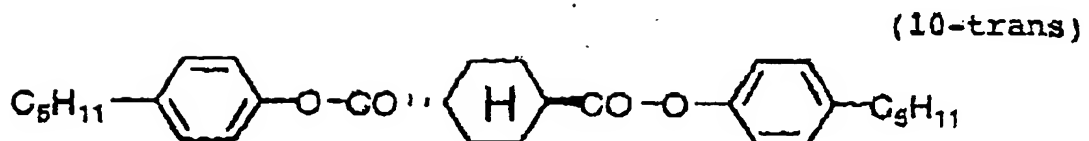
I hereby submit experimental results obtained from experiments which were performed by me or under my supervision.

**EXAMPLES 1 to 3**

**Example 1**

(Preparation of cellulose ester film)

At room temperature, 120 weight parts of cellulose acetate (average acetic acid content: 59.7%), 2.4 weight parts of an additive (10-trans), 9.36 weight parts of triphenyl phosphate, 4.68 weight parts of biphenyldiphenyl phosphate, 2.4 weight parts of tribenzylamine, 718 weight parts of methylene chloride, and 62.4 weight parts of methanol were mixed to prepare a solution (dope).



The prepared dope was cast on a glass plate, dried at room temperature for 1 minute, and further dried at 45°C for 5 minutes. After being peeled from the plate, the formed film was dried at 100°C for 30 minutes and then further dried at 130°C for 20 minutes. The amount of the solvent remaining in the obtained film was 0.5 wt. %.

After sized for a proper size, the film was stretched at 130°C parallel to the casting direction to be 1.33 times as long as the original length. In stretching the film, the film was let to shrink freely perpendicularly to the stretching direction. The stretched film was then cooled to room temperature. In the thus-treated film, the solvent remained in the amount of 0.1 wt. %. The thickness of the obtained film was 102  $\mu\text{m}$ . The ratio of stretching (SA/SB) was 1.48.

The Re retardation values of the prepared cellulose ester film (phase retarder) were measured at 450 nm, 550 nm and 590 nm by means of an ellipsometer (M-150, JASCO CORPORATION), and found to be 111.6 nm, 137.3 nm and 146.2 nm, respectively.

Further, the refractive index was measured by means of an Abbe's refractometer and also the angular dependence of retardation was measured at 550 nm, to determine the refractive index ( $n_x$ ) in the direction parallel to the slow axis in the plane, the refractive index ( $n_y$ ) in the direction perpendicular to the slow axis in the plane, and the refractive

index ( $n_z$ ) in the thickness direction. From the obtained refractive indexes at 550 nm, the value of  $(n_x - n_z)/(n_x - n_y)$  was calculated to find 1.50.

(Preparation of liquid crystal display of reflection type)

A polarizing plate and a phase retarder were removed from a commercially available liquid crystal display of reflection type (Color Zaurus MI-310, Sharp Corporation). In place of the removed members, the polarizing plate and the phase retarder prepared above (polarizing plate laminated with a protective film having AR-treated surface) were installed.

The thus-prepared liquid crystal display of reflection type was observed with the eyes. As a result, it was found that the display gave neutral gray without undesirable color in dark, bright and medium tone images.

Further, the contrast ratio of brightness in reflection was measured by means of a measuring apparatus (EZ-Contrast 160D, ELDIM), and thereby it was found that the front contrast ratio was 20. The viewing angle range giving a contrast ratio of 3 was  $120^\circ$  or more in both vertical (up-downward) and horizontal (left-rightward) directions.

(Spectrum of additive)

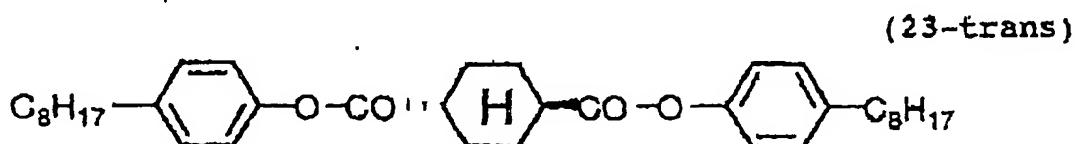
The absorption spectrum of the additive (10-trans) was measured in ultraviolet-visible (UV-vis) wavelength region in the following manner.

The additive (10-trans) was dissolved in tetrahydrofuran (without a stabilizer (BHT)) so that the concentration might be  $10^{-5}$  mol/dm<sup>3</sup>. The absorption spectrum of the thus-prepared solution was measured by means of a spectrophotometer (Hitachi, Ltd.).

In the obtained absorption spectrum, the maximum absorption peak was given at 220 nm ( $\lambda_{\text{max}}$ ) and the absorption coefficient ( $\epsilon$ ) at the peak was 15,000.

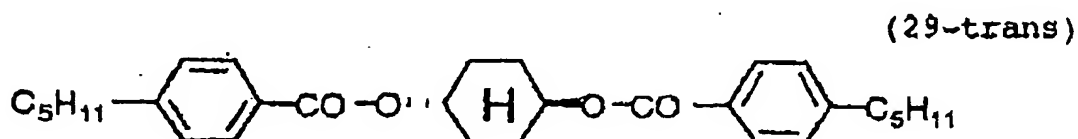
### Example 2

The procedure of Example 1 was repeated except for using another additive (23-trans) in place of 10-trans in an amount of 2.3 weight parts, to prepare a cellulose ester film (phase retarder). The retardation of the film was measured, and the results are set forth in Tables A and B.



### Example 3

The procedure of Example 1 was repeated except for using another additive (29-trans) in place of 10-trans in an amount of 2.0 weight parts, to prepare a cellulose ester film (phase retarder). The retardation of the film was measured, and the results are set forth in Tables A and B.



### COMPARATIVE EXPERIMENTS 1 to 6

In the following comparative experiments 1 to 6, I prepared and evaluated a cellulose ester film (phase retarder) in the same manner as in Example 1 above, except that the rod-like compounds (501), (503), (514), (518), (578) and (585) disclosed in *Mori et al* (European Patent Document No. EP 1 182 470 A1) on pages 37 and 39 were used respectively in place of the compound (10-trans).

Preliminary experiments were conducted to determine the optimum amounts of the rod-like compounds (578) and (585). The comparative experiments were conducted by using the determined optimum amounts of the compounds (578) and (585). The results are set forth in Tables A and B.

#### Comparative Experiment 1

##### (Preparation of cellulose ester film)

At room temperature, 120 weight parts of cellulose acetate (average acetic acid content: 59.7%), 1.8 weight part of the rod-like compound (578), 9.36 weight parts of triphenyl phosphate, 4.68 weight parts of biphenyldiphenyl phosphate, 2.4 weight parts of tribenzylamine, 718 weight parts of methylene chloride, and 62.4 weight parts of methanol were mixed to prepare a solution (dope).

(578)



The prepared dope was cast on a glass plate, dried at room temperature for 1 minute, and further dried at 45°C for 5 minutes. After being peeled from the plate, the

formed film was dried at 100°C for 30 minutes and then further dried at 130°C for 20 minutes. The amount of the solvent remaining in the obtained film was 0.5 wt.%.

After sized for a proper size, the film was stretched at 130°C parallel to the casting direction to be 1.33 times as long as the original length. In stretching the film, the film was let to shrink freely perpendicularly to the stretching direction. The stretched film was then cooled to room temperature. In the thus-treated film, the solvent remained in the amount of 0.1 wt.%. The thickness of the obtained film was 102  $\mu\text{m}$ . The ratio of stretching (SA/SB) was 1.48.

The Re retardation values of the prepared cellulose ester film (phase retarder) were measured at 450 nm, 550 nm and 590 nm by means of an ellipsometer (M-150, JASCO CORPORATION). The results are set forth in Table B.

(Preparation of liquid crystal display of reflection type)

A polarizing plate and a phase retarder were removed from a commercially available liquid crystal display of reflection type (Color Zaurus MI-310, Sharp Corporation). In place of the removed members, the polarizing plate and the phase retarder prepared above (polarizing plate laminated with a protective film having AR-treated surface) were installed.

The thus-prepared liquid crystal display of reflection type was observed with the eyes. The results are set forth in Table B.

(Spectrum of additive)

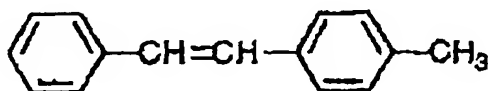
The absorption spectrum of the rod-like compound (578) was measured in ultraviolet-visible (UV-vis) wavelength region in the following manner.

The rod-like compound (578) was dissolved in tetrahydrofuran so that the concentration might be  $10^{-5}$  mol/dm<sup>3</sup>. The absorption spectrum of the thus-prepared solution was measured by means of a spectro-photometer (Hitachi, Ltd.). The results are set forth in Table A.

Comparative Experiment 2

The procedure of Comparative experiment 1 was repeated except for using 1.5 weight part of the rod-like compound (585) in place of (578), to prepare a cellulose ester film (phase retarder) and a liquid crystal display of reflection type.

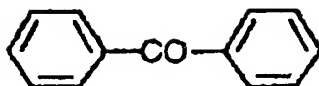
(585)



Comparative experiment 3

The procedure of Comparative experiment 1 was repeated except for using 4.0 weight parts of the rod-like compound (501) in place of (578), to prepare a cellulose ester film (phase retarder) and a liquid crystal display of reflection type.

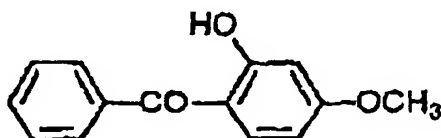
(501)



Comparative Experiment 4

The procedure of Comparative experiment 1 was repeated except for using 3.1 weight parts of the rod-like compound (503) in place of (578), to prepare a cellulose ester film (phase retarder) and a liquid crystal display of reflection type.

(503)

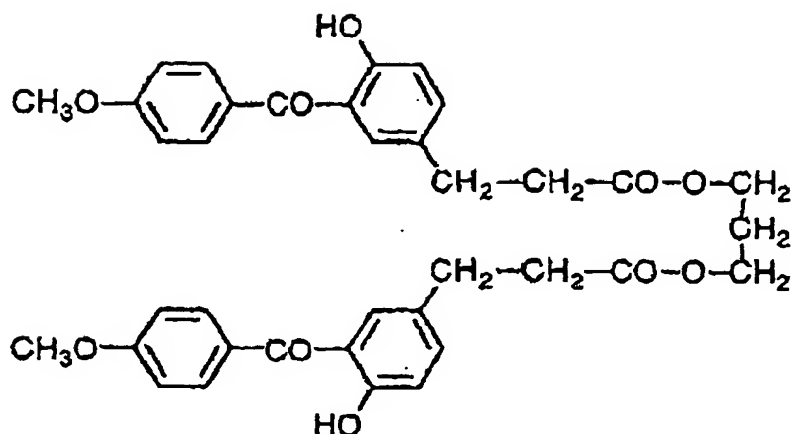


Comparative Experiment 5

The procedure of Comparative experiment 1 was repeated except for using 2.8 weight parts of the rod-like compound (514) in place of (578), to prepare a cellulose ester film (phase retarder) and a liquid crystal display of reflection type.



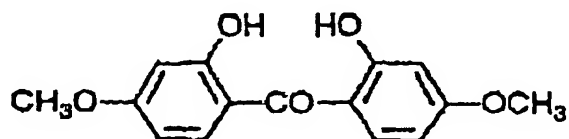
(514)



#### Comparative Experiment 6

The procedure of Comparative experiment 1 was repeated except for using 2.4 weight parts of the rod-like compound (518) in place of (578), to prepare a cellulose ester film (phase retarder) and a liquid crystal display of reflection type.

(518)



(Evaluation of phase retarder)

The Re retardation values of the prepared cellulose ester films (phase retarder) were measured at 450 nm, 550 nm and 590 nm by means of an ellipsometer (M-150, JASCO CORPORATION). The results are set forth in Table B.

(Evaluation of liquid crystal display of reflection type)

The prepared liquid crystal displays of reflection type were observed with the eyes. The results are set forth in Table B.

(Spectrum of additive)

The absorption spectra of the rod-like compounds (585) (501), (503), (514) and (518) were measured in ultraviolet-visible (UV-vis) wavelength region in the following manner.

Each of the rod-like compounds was dissolved in tetrahydrofuran so that the concentration might be  $10^{-5}$  mol/dm<sup>3</sup>. The absorption spectrum of the thus-prepared solution was measured by means of a spectrophotometer (Hitachi, Ltd.). The results are set forth in Table A.

TABLE A

Film	Additive	Amount of additive (weight parts)	Wavelength of absorption maximum ( $\lambda_{max}$ )	Absorption coefficient ( $\epsilon$ ) at absorption maximum
Example 1	10-trans	1.8	220 nm	15,000
Example 2	23-trans	2.3	230 nm	16,000
Example 3	29-trans	2.0	240 nm	20,000
Comp. Ex. 1	(578)	1.8	255 nm	26,000
Comp. Ex. 2	(585)	1.5	320 nm	30,000
Comp. Ex. 3	(501)	4.0	252 nm	20,000
Comp. Ex. 4	(503)	3.1	326 nm	44,000
Comp. Ex. 5	(514)	2.8	360 nm	44,000
Comp. Ex. 6	(518)	2.4	344 nm	12,000

TABLE B

Film	Retardation			Coloring*
	450 nm	550 nm	590 nm	
Example 1	111.6 nm	137.3 nm	146.2 nm	AA
Example 2	112.6 nm	137.5 nm	144.2 nm	AA
Example 3	113.6 nm	137.6 nm	143.1 nm	AA
Comp. Ex. 1	116.2 nm	137.5 nm	142.5 nm	BB
Comp. Ex. 2	125.2 nm	137.0 nm	139.4 nm	BB
Comp. Ex. 3	116.3 nm	137.5 nm	142.4 nm	BB
Comp. Ex. 4	126.2 nm	137.1 nm	139.4 nm	BB
Comp. Ex. 5	130.1 nm	137.5 nm	138.2 nm	CC
Comp. Ex. 6	127.2 nm	135.3 nm	139.0 nm	BB
Theoretical $\lambda/4$	112.5 nm	137.5 nm	147.5 nm	

Remarks: (coloring\*)

AA: undesirable colors are observed in neither dark, bright nor medium tone images; and

BB: bluish and yellowish undesirable colors are observed in bright and dark images; and

CC: undesirable colors are observed in dark, bright and medium tone images, and all the images exhibited low contrast, respectively.

### DISCUSSION

As is shown in the results shown in the comparative experiments 1 to 6 of Table A, the rod-like compounds disclosed in *Mori et al* exhibit the maximum absorption wavelengths of longer than 250 nm. Therefore, the rod-like compounds (501), (503), (514), (518), (578) and (585) are outside the scope of the present invention.

As is also apparent from the results shown in Table B, the retardation values of the cellulose ester films (phase retarders) using the rod-like compounds (501), (503), (514), (518), (578) and (585) are not similar to the values of the theoretical  $\lambda/4$  plate, compared with the phase retarders according to the present invention (Examples 1-3).

Further, bluish and yellowish undesirable colors are observed in bright and dark images respectively in the comparative experiments 1 to 6.

The undersigned declarant declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing therefrom.

Date 2006, 3, 15

Hiroshi Takeuchi  
HIROSHI TAKEUCHI